CHAPTER 4

4 ENVIRONMENTAL CONSEQUENCES

This chapter contains the heart of the environmental evaluation document. Its purpose is threefold: first, to describe the environmental consequences of project development; second, to determine whether impacts of the project would significantly affect the human environment; and third, if significant impacts are identified, to determine whether those impacts will be mitigated so that the impacts are no longer significant under the project as proposed, as could be so mitigated through permit conditions.

Environmental consequences. On a resource-by-resource basis, this chapter describes the consequences to the environment that are expected from developing the True North project. These consequences are simply the changes from the baseline conditions, which are described in Chapter 3 (Affected Environment), that would occur.

Significance. To determine whether expected impacts would be significant, the Council on Environmental Quality (CEQ) regulations at 40 CFR, Section 1508.27, were used. Following is the excerpt from the regulations containing the definition of the term "significantly":

a) *Context.* This means that the significance of an action must be analyzed in several contexts such as society as a whole (human, national), the affected region, the affected interests, and the locality. Significance varies with the setting of the proposed action. For instance, in the case of a site-specific action, significance would usually depend upon the effects in the locale rather than in the world as a whole. Both short- and long-term effects are relevant.

b) *Intensity*. This refers to the severity of impact. Responsible officials must bear in mind that more than one agency may make decisions about partial aspects of a major action. The following should be considered in evaluating intensity:

    i. Impacts that may be both beneficial and adverse. A significant effect may exist even if the Federal agency believes that on balance the effect will be beneficial.

    ii. The degree to which the proposed action affects public health or safety.

iii. Unique characteristics of the geographic area such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas.

iv. The degree to which the effects on the quality of the human environment are likely to be highly controversial.

v. The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks.

vi. The degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration.

vii. Whether the action is related to other actions with individually insignificant but cumulatively significant impacts. Significance exists if it is reasonable to anticipate a cumulatively significant impact on the environment. Significance cannot be avoided by terming an action temporary or by breaking it down into small component parts.

viii. The degree to which the action may adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of substantial scientific, cultural, or historical resources.

ix. The degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act of 1973.

x. Whether the action threatens a violation of Federal, State, or local law or requirements imposed for the protection of the environment.

These significance criteria were used during the analyses of the consequences of project development on the existing environment.

To determine whether development, operation, or closure of the True North project would have a significant impact on the human environment, the appropriate context within which that determination could be made had to be defined. The context is based on the COE's jurisdiction over the project as described in Section 4.20.1. Generally, this is the area circumscribed by the True North Mine and the Fort Knox Mill at opposite ends, with the proposed road that connects them in between. (See Figure 1.2.2.) For those resources for which specific, measurable standards exist, often in the form of permit requirements, whether an impact would be significant was judged in the context of whether those standards could be met (water quality, air quality, noise). For those resources where a generally accepted process of mitigation exists so that significant impacts are avoided or minimized, significance was judged by whether that process would be adhered to (cultural resources, wetlands). For other resources that are usually strongly influenced by hydrologic patterns (vegetation, hydrology, fish, wildlife), the determination of significance was made in the context of the entire watersheds within which the project is located. For mine site effects this was the Dome and Little Eldorado creek drainages. The determination of significant impacts to other resources was considered in other contexts more appropriate to each specific resource. Throughout this chapter, the context for the determination of significance for each resource is described in the section that addresses the resource.

Mitigation. Section 2.3.21 (Mitigation) defines the term mitigation and its meanings under the CEQ guidelines. The section also lists many of the mitigation measures that FGMI has used already, or would use, to minimize impacts during project design, construction, operation, and closure.

An important use of mitigation is to ensure that significant environmental impacts do not occur. By applying appropriate mitigation measures, an action that might otherwise produce a significant impact can be made insignificant, thus eliminating or reducing controversy and concern. This chapter identifies many specific mitigation measures that have been taken, or would be taken, to prevent significant impacts from occurring.

4.1 SUMMARY

The True North project as proposed by FGMI, including procedures to mitigate potential impacts described in Section 2.3.21, would not result in significant impacts to the human environment in the True North project area. Some resources would be affected by short-term impacts, but these effects would not be significant.

Following is a resource-by-resource discussion of the project's expected impacts, whether the impacts would be significant, and, if so, whether they could be mitigated.

4.2 SURFACE WATER HYDROLOGY

For Sections 4.2 (Surface Water Hydrology), 4.3 (Groundwater Hydrology), and 4.4 (Water Quality), the significance of impacts is determined within the context of the Dome Creek and Little Eldorado Creek drainages, the hydrologic systems within which the mine site is situated.

The Hindenburg and East pits, the various development rock, ore, and growth medium stockpiles, and the maintenance complex would not intersect any channeled surface water flows such as creeks. The possibility of a slight increase in groundwater recharge, discussed below, likely would have little or no impact on the overall groundwater flow system. Such an increase in recharge might result in slight increases in groundwater discharge flows to streams downgradient of the site. Such increases, however, would be low in intensity and would not be significant within the context of the Dome Creek and Little Eldorado Creek drainages.

4.3 GROUNDWATER HYDROLOGY

Within the context of the Dome Creek and Little Eldorado Creek drainages, the proposed True North Project would not have significant impacts on groundwater flows for the following reasons.

- The open pits likely would receive minor flows of isolated groundwater above the permafrost, or from liquid water within permafrost encountered in the wall rocks. This water would be handled by pumping via sumps to a holding pond for evaporation or, if possible, land application. None of this water would be discharged from the site. Because of the isolated nature of these flows, their interception would not impact regional groundwater flow conditions.
- The mine plan has been designed such that no groundwater inflows to the pits are expected. Therefore, no dewatering or discharge of waters would be necessary.
- Approximately 47 percent of the pit area is underlain by permafrost. As mining progressed, the removal of permafrost might result in the potential for enhanced infiltration through the pits.
- The maximum estimated potential infiltration would be approximately 2.1 gpm. This represents a minimal potential increase in general groundwater system through-flow rates. This minimal increase in recharge likely would have no impact on general groundwater flow conditions.

4.3.1 POTENTIAL FLOWS FROM THE PIT WALLS DURING MINING

During mining of both open pits, isolated low flows of water likely will be encountered from both runoff of precipitation and minor flows from fractures within the pit walls. The proposed open pits both lie within some permafrost. As mining commences, isolated shallow water zones likely will be encountered above the permafrost, as evidenced by shallow water encountered in the area of temporary piezometer TN-976. These flows likely are isolated in nature, and should produce only low flow rates for short periods of time.

In addition, certain zones within the permafrost encountered within the pit walls also may include liquid water or high ice contents that may melt. These types of minor flows are frequently encountered in the open pit at the Fort Knox Mine. Both the presence of isolated flows from above the permafrost, and from isolated zones within the permafrost, likely will require the development of sumps within the pits to handle this water. The water will be pumped to a holding pond for evaporation or land application (watering of roads for dust control).

4.3.2 POTENTIAL GROUNDWATER INFLOW TO THE PIT AREAS

An important aspect of mine design is whether the proposed Hindenburg and East pits would intersect the groundwater table, and if dewatering would be required.

The potentiometric surface map presented in Figure 4.3-1 presents an assessment of the current potentiometric surface based on water levels observed in historic and current wells and temporary piezometers. The figure includes the planned Hindenburg and East pit designs. Groundwater elevations beneath the pit areas range from approximately 1,300 ft to 1,100 ft amsl. The deepest point planned for the Hindenburg pit is 1,170 ft, while the deepest point planned for the East pit is 1,210 ft.

A series of four cross-sections was developed to assess groundwater elevations in relation to the deepest points of both the Hindenburg and East pits. These cross-sections (labeled A-A', B-B', C-C', and D-D') are shown on Figures 4.3-2 through 4.3-5. The cross-section locations are shown on Figure 3.7-2. Cross-sections A-A' and D-D' pass through the deepest portion of the Hindenburg Pit, while cross-section B-B' passes through the deepest portion of the East Pit.

As shown on cross-section B-B', the groundwater table is estimated at more than 150 ft below the deepest portion of the East Pit. Therefore, no groundwater inflows from the main groundwater system are expected to occur within the East Pit. Both cross-sections A-A' and D-D' show there is a potential for the deepest portion of the Hindenburg Pit to penetrate the groundwater table. Groundwater elevations in this area were interpreted to be approximately 1,200 ft amsl, while the pit floor is currently planned to penetrate to 1,170 ft. Based on this assessment, the Hindenburg Pit may

penetrate the groundwater table by as much as 30 ft, potentially resulting in inflows of groundwater to the pit. Consequently, .mine plans for the Hindenburg Pit will be monitored and altered to inusre mining stays above the water table.

The area within the Hindenburg Pit extending below 1,200 ft, however, would be extremely limited, and represents only a small portion of the proposed pit. Also, there are uncertainties as to where the actual water table may be in this area at the time of mining. Lower water levels than expected could be encountered if the observed general decline in water levels continues over time. At present, the planned approach for pit development is to not mine into areas that would require active dewatering and discharge of groundwaters. Minor inflows to the pit would be handled through sumping, with water held onsite for evaporation or land application.

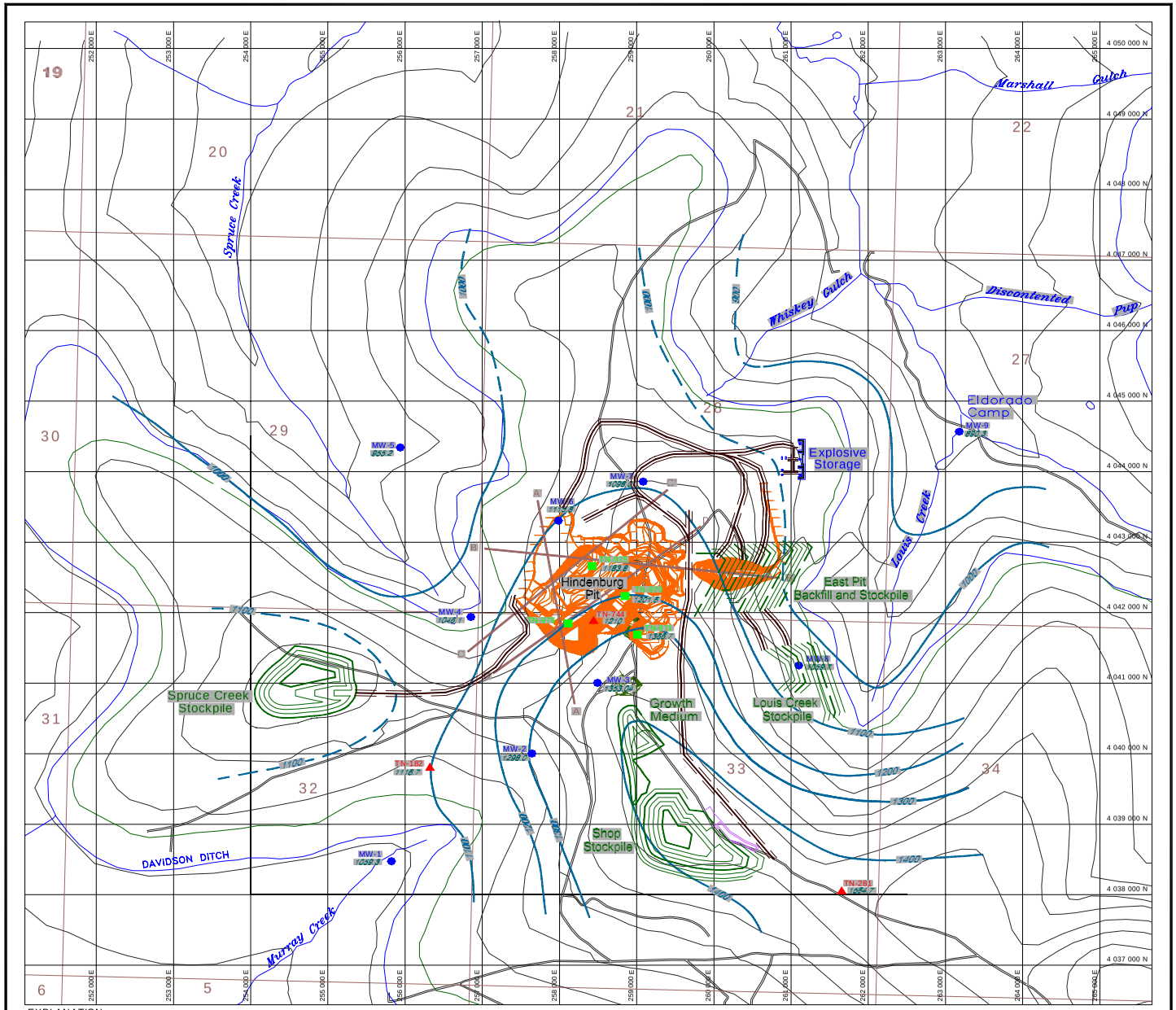

Figure 4.3-1

Potentiometric surface map

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Figure 4-3-2 Mine pits cross section A-A'

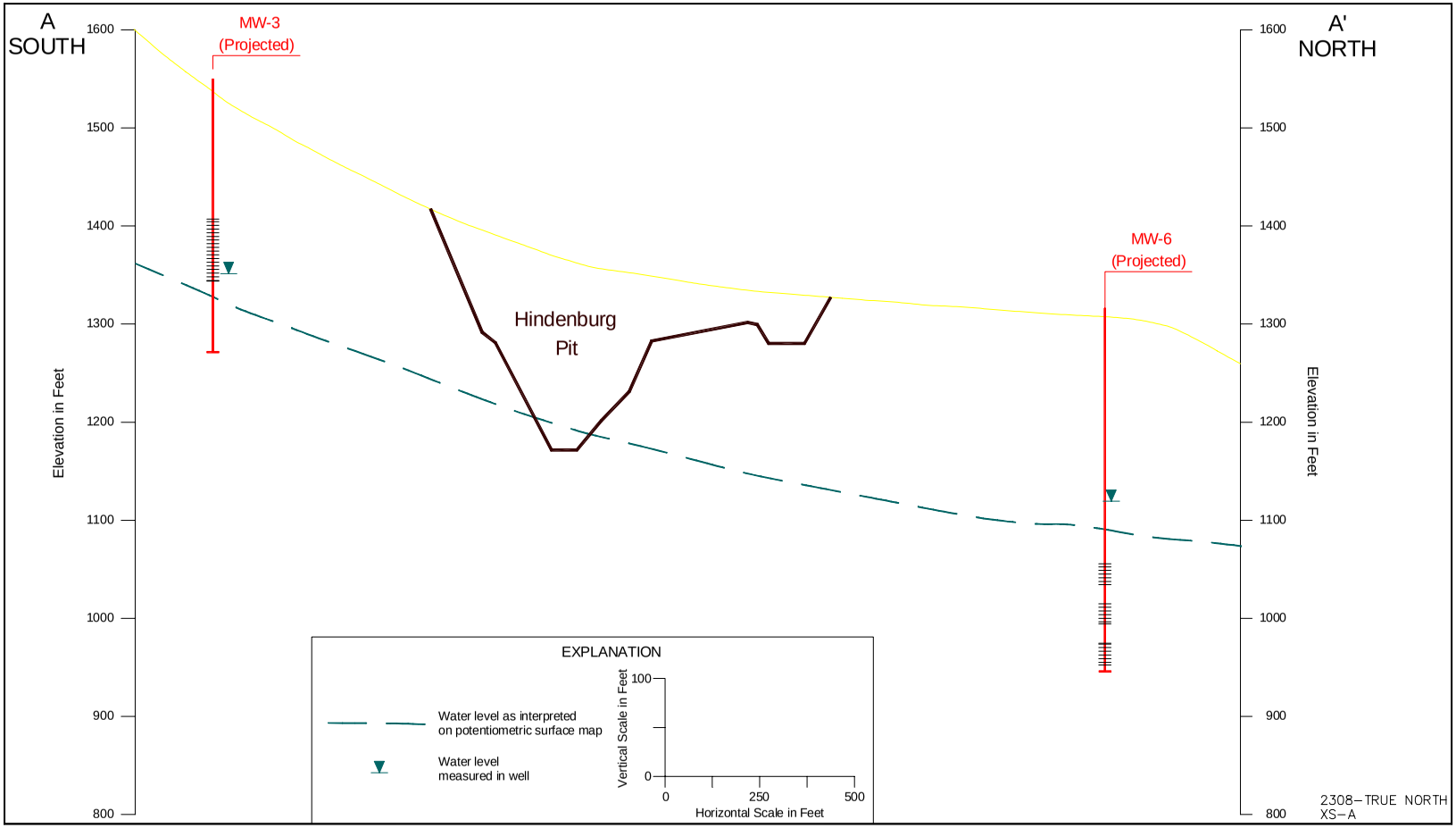

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Figure 4.3-3 Mine pits cross section B-B'

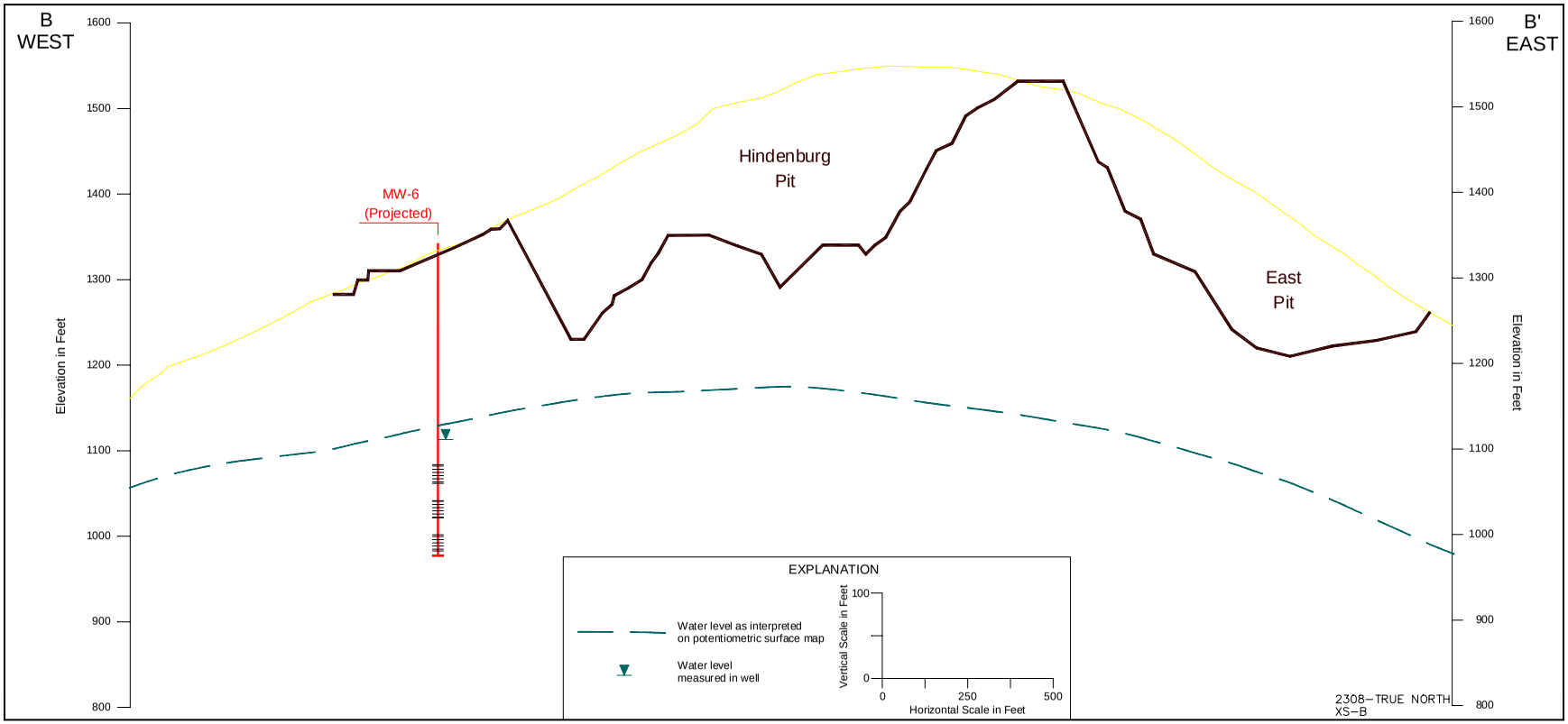

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Figure 4.3-4 Cross section C-C'

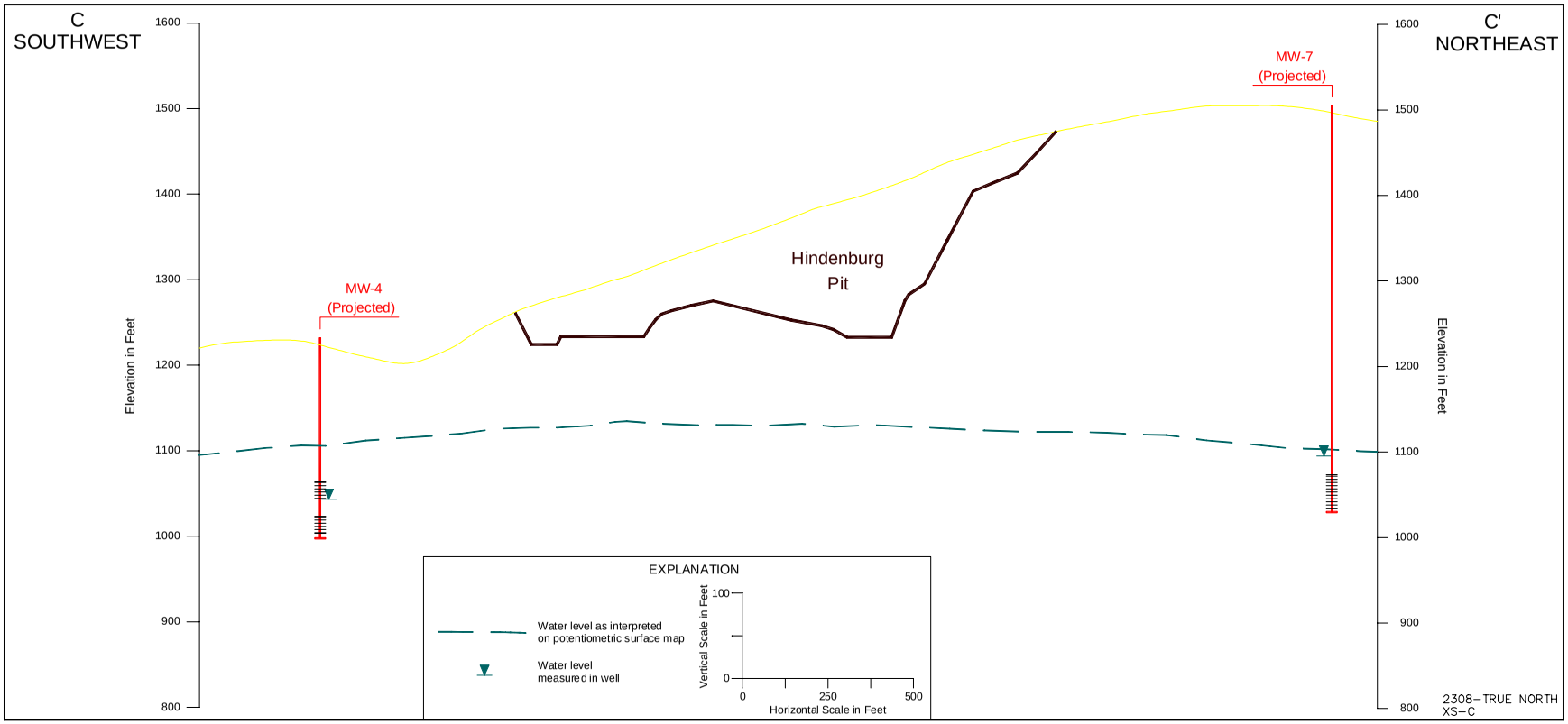

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Figure 4.3-5 Mine pits cross section D-D'